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RELIABILITY AND QUALITY ASSURANCE PUBLICATION

QUALITY PROGRAM PROVISIONS FOR AERONAUTICAL AND SPACE SYSTEM CONTRACTORS

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PROVISIONS FOR AERONAUTICAL AND
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National Aeronautics and Space Administration

PREFACE

Date: April 1969

This publication establishes common, general requirements for contractor quality programs to ensure the required high quality of NASA aeronautical and space systems.

NASA Installations shall invoke the requirements of this publication contractually to the extent needed and consistent with NASA program planning.

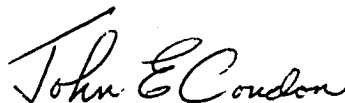
Questions concerning application of this publication to specific procurements shall be referred to the procuring NASA Installation or its designated representative. General questions concerning this publication shall be referred to the Reliability and Quality Assurance Office, NASA Headquarters, Washington, D.C. 20546.

This publication shall not be rewritten or reissued by NASA Installations in any other form.

Copies of this publication are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Superseded Document

Quality Program Provisions for Space System Contractors (NPC 200-2), April 1962 Edition is canceled.



John E. Condon
Director
Reliability and Quality
Assurance

Distribution:
SDL 1 (SIQ)

ORGANIZATION OF THE R&QA MANUAL

OVERALL COVERAGE

The Reliability and Quality Assurance Manual--referred to as the "R&QA Manual"--is the overall generic title which identifies all NASA R&QA management publications published under the basic R&QA subject classification code. The publications are grouped by major subject breakdown and further divided into specific categories identified as Parts. These Parts (not a complete R&QA Manual) are published as individual R&QA publications.

The following list shows the grouping and present plan for publishing the individual R&QA publications:

<u>Part</u>	<u>Title</u>	<u>Assigned no.</u>
<u>Volume 1 - General Provisions</u>		
A	Reliability Program Requirements	_____
B	Quality Program Provisions for Aeronautical and Space System Contractors (Formerly NPC 200-2)	NHB 5300.4(1B)
<u>Volume 2 - Government Agency Provisions</u>		
A	Management of Government Quality Assurance Functions for Supplier Operations	_____
B	Quality Assurance Requirements	_____
<u>Volume 3 - Standards</u>		
A	Requirements for Soldered Electrical Connec- tions (Formerly NPC 200-4)	NHB 5300.4(3A)

DOCUMENT REFERENCING

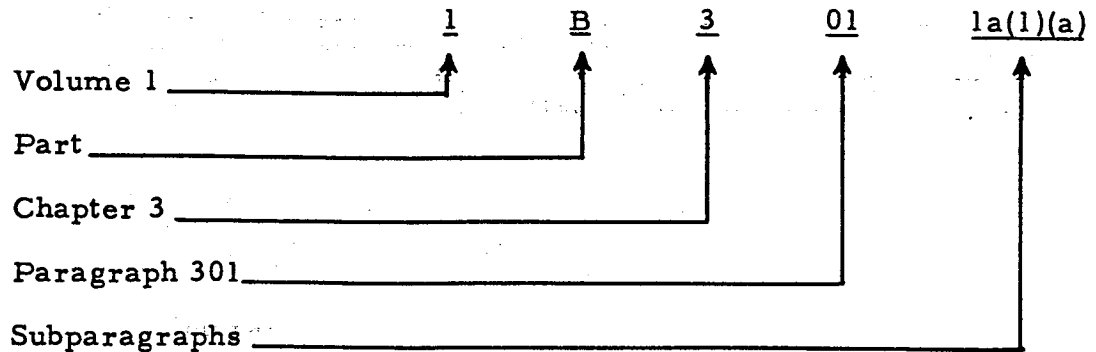
Each R&QA Manual Part is assigned its own identification number within the basic classification code. The numeric-alpha suffix within a parenthesis identifies the grouping of the publication, that is, the volume and part, such as NHB 5300.4(1B): this number indicates that this is the first "General Provisions" to be used under Volume 1.

When a part is revised, the suffix identification will be changed to indicate the revision number such as NHB 5300.4(1B-1).

In referencing or requesting any R&QA publication, the complete specific NHB number must be used.

PARAGRAPH REFERENCING

1. Within the R&QA Manual. The following shows the paragraph numbering system applicable to this publication.



This system provides for referencing any R&QA publication requirement (paragraph) in any other R&QA publication without the need for identifying the NHB number, title, the volume number, or part. However, when referencing a complete Part within another R&QA publication, the specific NHB number must be used.

2. In Other NASA Documents. When it is necessary to reference an R&QA publication requirement (paragraph) in any other NASA document, the specific NHB number and paragraph number must be used together as follows: "NHB 5300.4(1B), par. 3A301-1a(1)(a)," or "paragraph 3A301-2b of NHB 5300.4(1B)."

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CHAPTER 1: INTRODUCTION

1B100 GENERAL

This publication sets forth quality program requirements for NASA aeronautical and space programs, systems, subsystems and related services. These requirements provide for the effective operation of a quality program which ensures that quality criteria and requirements are recognized, definitized, and performed satisfactorily.

1B101 RELATION TO OTHER CONTRACT REQUIREMENTS

The quality program requirements set forth in this publication shall be satisfied in addition to all detail requirements contained in the statement of work or in other parts of the contract. Overlapping and interfacing contractual requirements, such as reliability, safety and test, shall not result in duplication of contractor efforts. The quality program shall effectively complement and support functions required by other contract requirements.

1B102 ACTIONS AND PREROGATIVES OF THE GOVERNMENT

1. The operations and work of the contractor and his suppliers are subject to evaluation, review, audit, survey, and inspection by the procuring NASA Installation and its designated Government quality representatives. Actions by or on behalf of the Government will determine that:
 - a. The contractor meets contractual requirements, and
 - b. Materials, articles and related services are of satisfactory quality and meet the intended design.
2. DESIGNATED GOVERNMENT QUALITY REPRESENTATIVES. Government quality representatives may be assigned on a resident or itinerant basis at the contractor or supplier's facilities. The responsibilities and authorities delegated to these representatives will be defined by the NASA Contracting Officer.
3. CONTRACTOR SUPPORT TO DESIGNATED GOVERNMENT QUALITY REPRESENTATIVES. The contractor shall provide the representative with information, documents, records, inspection equipment, samples, materials, and reasonable facilities and assistance for the safety and convenience of the representative in the performance of his duties.

1B103 QUALITY PROGRAM DOCUMENTS

1. Appendix A, "Quality Program Document Cross Reference Index," lists quality program documents detailed in this publication. The contract will specify those documents to be submitted to the procuring NASA Installation and/or its representative for approval, review or information. Government and contractor actions for submitted documents and their revisions are as follows:
 - a. Approval. Documents in this category require written NASA approval prior to use. Receipt by NASA shall occur within the time specified in the contract. Requirements for resubmission shall be as specified in letter(s) of disapproval.
 - b. Review. Documents in this category require receipt by NASA prior to use and within the time period specified in the contract. They are subject to evaluation by NASA or its designated representatives to determine contractor effectiveness in meeting contract objectives. When Government evaluations reveal inadequacies, the contractor will be requested to correct the documents.
 - c. Information. Documents in this category require receipt by NASA within the time period specified in the contract for the purpose of determining current program status, progress, and future planning requirements.
2. The contractor shall generate and utilize those documents necessary to meet cited requirements of the contract. These, and other contractor documents, shall be readily available to the procuring NASA Installation and its designated Government quality representative, and shall be submitted upon request.

1B104 GLOSSARY OF TERMS

Appendix B, "Glossary of Terms," defines selected terms utilized in this publication.

CHAPTER 2: QUALITY PROGRAM MANAGEMENT AND PLANNING

1B200 GENERAL

The contractor shall maintain an effective and timely quality program planned and developed in conjunction with all other contractor's functions necessary to satisfy the contract requirements. The program shall:

1. Demonstrate recognition of the quality aspects of the contract and an organized approach to achieve them.
2. Ensure that quality requirements are determined and satisfied throughout all phases of contract performance, including preliminary and engineering design, development, fabrication, processing, assembly, inspection, test, checkout, packaging, shipping, storage, maintenance, field use, flight preparations, flight operations, and post-flight analysis, as applicable.
3. Ensure that quality aspects are fully included in all designs and are continuously maintained in the fabricated articles and during operations.
4. Provide for the detection of actual or potential deficiencies, system incompatibility, marginal quality, and trends or conditions which could result in unsatisfactory quality.
5. Provide timely and effective remedial and preventive action.

Objective evidence of inspections and tests shall be readily available to the procuring NASA Installation and its designated representative.

1B201 ORGANIZATION

The contractor shall make functional assignments to implement each element of his quality program. Personnel performing quality program functions shall have sufficient, well-defined responsibility and the organizational freedom to assess problems and to recommend and/or effect solutions. The effectiveness of quality program functions and the ability of assigned personnel to objectively assess, document, and report findings shall be maintained during all phases of the contract work and shall not be reduced by other considerations, such as the influence of engineering changes, rework, or rescheduling. The contractor shall designate one individual responsible for directing and managing the quality program. He shall have direct, unimpeded access to higher management and shall report regularly to higher management on the status and adequacy of the program.

1B202 TRAINING

1. The contractor shall have trained and competent personnel for implementing the quality program. The contractor shall develop, maintain, and implement necessary training for engineering, fabrication, test, procurement, quality assurance, and other personnel who may have an effect upon or who are responsible for the determination of quality or to meet cited requirements of this publication. Training activities shall be documented and shall provide for:
 - a. Excellence of workmanship and personnel skills.
 - b. Careful and safe operations.
 - c. Maintenance and improvement, where necessary, of article and material quality.
2. CERTIFICATION OF PERSONNEL. Contractor personnel controlling selected processes and personnel performing selected operations shall be certified. Certification by the contractor may be reviewed or repeated by the procuring NASA Installation or its designated Government quality representative to verify the adequacy of such certifications. Certification of personnel shall be based upon objective evidence which includes training and testing. Certified personnel shall be given a card, badge, or similar evidence of certification.
3. RECERTIFICATION OF PERSONNEL. Contractor personnel shall be recertified based on contractor or Government observation of unsatisfactory quality of articles or services; changes in techniques, parameters or required skills; or interruption of work period as established for the process or operation involved. Recertification shall require retesting of the individual to the testing procedure to demonstrate continuing proficiency. Persons failing the retest shall not be permitted to perform these processes or operations until provided with additional training and required proficiency has been demonstrated.
4. RECORDS. Records shall be maintained of the training, testing, and certification status of personnel.

1B203 QUALITY INFORMATION

The contractor shall provide for the collection, processing, analysis, and recording of quality information resulting from the design, procurement, fabrication, test, inspection, and usage of articles and materials procured and produced. Quality information shall be promptly disseminated to all concerned areas within the contractor's organization and to concerned suppliers to effectively implement quality program requirements and contract requirements.

1B204 QUALITY STATUS REPORTING

The contractor shall report the status of the quality program on a periodic basis, as specified in the contract. The report shall include, as required:

1. Organization and key personnel changes.
2. Significant program and article or material problems, their solutions and remedial and preventive actions.
3. Contractor performance, such as inspection and test activities and procurement activities relative to supplier selections, surveys, and procurement document reviews.
4. Supplier performance, such as acceptance and rejection rates.

1B205 QUALITY PROGRAM AUDITS

1. GENERAL. The contractor shall conduct audits of personnel, procedures, and operations which implement the quality program. Each audit shall be performed by a team of contractor personnel familiar with all written procedures and standards applicable to the operation or work areas being audited and shall include personnel not having specific line responsibilities in those areas. Each audit shall include examination of all operations and documentation, evaluation of actual operations as compared with established requirements, recommendations for remedial and preventive action, and follow-up to assess results of recommendations. Audits shall include examination of articles and materials to verify the effectiveness of the contractor's efforts.
2. UNSCHEDULED AUDITS. Random unscheduled audits shall be performed in order to effectively assess existing conditions and operations.
3. AUDIT REPORTS. The results of audits in each area shall be documented in a report to contractor higher management with appropriate recommendations for correction of deficiencies. Management action shall be taken to ensure effective correction of the reported deficiencies. Follow-up reviews shall be made to ensure that required corrections have been implemented.

1B206 QUALITY PROGRAM PLAN

1. The contractor shall prepare, maintain, and implement a Quality Program Plan which describes how the contractor will ensure compliance with cited quality requirements. The Quality Program Plan shall be submitted as required by the Request for Proposal or Contract. The Plan format shall be readily identified with each cited requirement. The Plan shall cover all quality program activities for the time period or phase authorized, be updated periodically, and resubmitted, as specified in the contract, and serve as the master planning and control document.

2. QUALITY PROGRAM PLAN CONTENTS. The Plan shall include:
- a. Charts and narrative statements describing each element of the contractor's organization (e.g., procurement, engineering, reliability, fabrication, test, safety, and quality assurance) which implement the quality program and detailed statements of duties, functions, and responsibilities relating to each quality program task. The Plan shall show the relationship of the individual managing the quality program with each element performing quality program tasks, including his authority to control and monitor cited tasks.
 - b. Narrative descriptions which describe the contractor's execution and management of each task. These shall be detailed in terms of when, by which organizations, and by which methods each task will be accomplished. Applicable contractor policies and procedures shall be referenced in the plan.
 - c. Identification of those elements of the planned program which will utilize the contractor's existing quality program documents and operations and identification of those requiring change. Proposed changes needed to meet cited requirements and the time schedule for implementing such changes shall be delineated.
 - d. Charts indicating the flow of fabrication and assembly operations and related inspection and test points.
3. SITE PLANS. Separate Quality Program Plans, or a Plan having separate parts, shall be prepared for the contractor's activities at the plant site and at each remote test and launch site.

CHAPTER 3: DESIGN AND DEVELOPMENT CONTROLS

1B300 TECHNICAL DOCUMENTS

1. The contractor shall establish, document and ensure compliance with design control requirements and quality criteria during all phases of contract work. Contractor technical documents such as specifications, procedures, drawings, fabrication and planning documents, and process sheets shall be developed and shall include, as applicable, the following information:
 - a. Characteristics and design criteria necessary for procurement, fabrication (including assembly), and inspection and test operations.
 - b. Characteristic tolerances.
 - c. Identification in accordance with Chapter 4.
2. DOCUMENT REVIEW. Contractor quality assurance personnel shall conduct timely reviews of technical documents, and changes thereto. Reviews shall ensure that all necessary information has been included and that requirements are clear and unambiguous. The reviews shall be documented, deficiencies in the documents reported to responsible personnel, and action taken to ensure correction of the deficiencies prior to document release. These reviews shall be used in timely quality planning for subsequent procurement, fabrication, inspection and test activities.

1B301 QUALITY SUPPORT TO DESIGN REVIEW

Quality assurance personnel shall participate in design reviews to ensure that designs permit and facilitate producibility, repeatability, and inspectability and that related quality considerations are obtained.

1B302 CHANGE CONTROL

1. The contractor shall ensure control of all documents, and changes thereto, affecting the quality program. Documents shall be distributed to the proper points at the proper times, and obsolete documents removed from operating areas. The change control system shall be documented. The control system shall provide for initiation of document change requests. Changes which involve interface relationships or which affect articles not under design control of the contractor shall be coordinated with the affected parties. The contractor shall effectively integrate these requirements with other document control requirements of the contract.

2. **EFFECTIVITY.** The contractor shall clearly specify the effectivity point of documents and changes which affect materials, fabrication, or performance. The contractor shall ensure that: changes are accomplished on the affected articles or materials at the authorized point; changed articles are appropriately marked or identified; and associated documents are revised accordingly. Provisions shall be made for inspection and test of changed articles or materials.

CHAPTER 4: IDENTIFICATION AND DATA RETRIEVAL

1B400 GENERAL

The contractor shall develop and maintain an identification and data retrieval system for articles and materials to provide:

1. Identification to which procurement, fabrication, processing, inspection, test, and operating records can be related, and
2. Means for locating articles and materials.

The contractor system shall be developed in conjunction with other contractor systems, such as engineering documentation control, configuration management and logistics management. Common identification numbers and procedures shall be used among all systems.

1B401 IDENTIFICATION METHODS

Each article and material shall be identified by a unique part or type number. Where control of individual articles or lots of articles or materials is required, one or more of the following detailed identification methods shall also be used, as applicable:

1. DATE CODES. Date codes indicating date of manufacture to identify articles or materials made by a continuous and controlled process and those which are subject to variations or degradation with age.
2. LOT NUMBERS. Lot numbers to identify articles or materials produced in homogeneous groups and where unique data are not required to be related to individual items. Heat, billet, or batch numbers are included in this category.
3. SERIAL NUMBERS. Serial numbers to identify individual materials or articles for which unique data are to be maintained or when other reasons exist for individual control.
4. OTHER IDENTIFICATION. Other identification methods, such as paint dots in lieu of or in addition to the methods specified herein, upon approval of their designated Government quality representative.

1B402 DOCUMENTATION

Method and location of part or type numbers and detailed identification on articles and materials shall be indicated on technical documents.

1B403 IDENTIFICATION CONTROL

Controls shall be established to ensure that detailed identification numbers for individual articles and materials or lots thereof are assigned in a consecutive manner. Records for articles and materials shall indicate applicable part or type numbers and associated detailed identification. This shall provide the capability of tracing backward to the material from which fabrication originated and forward to determine the location of like articles or materials within a level of process or assembly. Serial or lot numbers of scrapped articles or materials shall not be used for other similar articles or materials.

1B404 IDENTIFICATION LIST

Upon initiation of design activity, the contractor shall establish and maintain an Identification List containing reference to contractor- and supplier-designed articles. This list shall indicate the part or type number for articles and materials and the applicable type of group or individual identification. The List may be initially prepared in generic terms; specific part numbers and related information shall be included as design progresses.

1B405 RETRIEVAL OF RECORDS

Contractor identification systems shall ensure that article and material procurement, fabrication, processing, inspection and test records are related to the articles and materials specified in the Identification List. It shall be organized so that these records and the related articles and materials may be located and retrieved in the event verification of, or removal of articles or materials becomes necessary.

CHAPTER 5: PROCUREMENT CONTROLS

1B500 GENERAL

The contractor is responsible for the adequacy and quality of all contractor-purchased articles, materials, and services.

1B501 SELECTION OF CONTRACTOR PROCUREMENT SOURCES

Contractor quality assurance personnel shall participate in the selection of procurement sources. The contractor's selection shall be based upon one of the following:

1. The supplier shall have a previous and continuous record of supplying quality articles, materials, or services of the type being procured. The quality record shall be supported by documented qualitative and quantitative information.
2. A pre-award survey of the supplier's facility and quality system shall be conducted to determine if he is capable of satisfying procurement quality requirements.
3. When articles or materials are not fabricated specifically for contracts or subcontracts issued under NASA contracts and the contractor has no previous quality record of the supplier for such articles and materials, a pre-award survey of the supplier is not required. In such cases, a thorough inspection of the articles and materials shall be performed in accordance with technical documents.

1B502 PROCUREMENT DOCUMENTS

1. REVIEW. Procurement documents which are issued at contractor plant sites and facilities, including other divisions or subsidiaries of the contractor, shall be reviewed by quality assurance personnel prior to release for adequacy of quality requirements. Such reviews shall be documented and shall include determination that:
 - a. Suppliers have been selected in accordance with par. 1B501, and
 - b. Applicable provisions of subpar. 2 have been properly cited.
2. CONTENTS. Procurement documents shall contain provisions for the following:
 - a. Supplier Quality Programs. The supplier and his procurement sources shall be required to comply with one of the following:
 - (1) Subcontracts for procurement of systems, subsystems, and related services shall invoke this publication or applicable portions thereof.

(2) All other suppliers shall be required to follow quality program requirements as specified in the contract.

b. Basic Technical Requirements. Procurements shall specify or reference technical requirements for articles, materials or services to be provided by a supplier. Applicable revisions shall also be indicated and documents provided.

c. Detailed Quality Requirements. The following detailed quality requirements, as necessary, shall be additionally included or technical documents containing these requirements shall be referenced. Applicable revisions of referenced documents shall be indicated and documents provided as necessary to the supplier.

(1) Changes. The supplier shall be required to notify the contractor of any proposed changes in design, fabrication methods, or processes approved by the contractor, including changes which may affect the quality or intended end-use of the item, and obtain written approval of the change from the contractor before making the change. Changed articles shall be identified differently from previous articles. When a proprietary item is procured by the contractor, the supplier shall be required to notify the contractor of changes.

(2) Purchased Raw Materials. Purchased raw materials shall be accompanied with chemical and/or physical test results.

(3) Raw Materials Used in Purchased Articles. Tests performed on specimens or detailed analyses of supplier's acceptance test results on all raw materials that are required to satisfy specification requirements and which are employed in the fabrication of articles purchased on this subcontract or purchase order shall be made available to the contractor upon request.

(4) Preservation, Packaging, Packing, and Shipping. Requirements for preservation, packaging, packing and shipping of articles and materials shall be specified or referenced.

(5) Age Control and Life Limited Products. Records for articles and materials having definite characteristics of quality degradation or drift with age and/or use shall indicate the date and test time or cycle at which useful life was initiated, the life or cycles used, and the date and test time or cycle at which useful life will be expended. When appropriate, specify that the articles and materials exhibit similar information. The supplier shall ensure removal or rework of such articles and materials as required.

(6) Identification and Data Retrieval. Identification and data retrieval requirements shall be specified.

- (7) Inspection and Test Characteristics. Characteristics to be subjected to inspections or tests by the supplier shall be specified.
- (8) Inspection and Test Records. Inspection and test records to be maintained by the supplier to provide evidence of supplier inspections and tests shall be clearly specified. Records to be provided to the contractor or his source inspection personnel shall be specified.
- (9) Resubmission of Nonconforming Articles or Materials. Nonconforming articles and materials returned to the supplier by the contractor and subsequently resubmitted by the supplier to the contractor shall bear adequate identification of such resubmission either on the article or material or on supplier records. Reference shall be made to the contractor's nonconformance document and evidence provided that causes for nonconformances have been corrected and actions taken to preclude recurrence.
- (10) Contractor Quality Assurance Activity at Source. When contractor quality assurance activity is required at source, the procurement document shall so indicate.
- (11) Government Source Inspection (GSI). When the Government elects to perform inspection at a supplier's plant, the following statement shall be included in the procurement document:

"All work on this order is subject to inspection and test by the Government at any time and place. The Government quality representative who has been delegated NASA Quality Assurance functions on this procurement shall be notified immediately upon receipt of this order. The Government representative shall also be notified forty-eight (48) hours in advance of the time articles or materials are ready for inspection or test."
- (12) Procurements Other Than Those Requiring GSI. Procurements which do not require Government Source Inspection shall include the following statement:

"The Government has the right to inspect any or all of the work included in this order at the supplier's plant."
- (13) Equipment Records. Detailed requirements for equipment records shall be specified.

1B503 CONTRACTOR QUALITY ASSURANCE PERSONNEL AT SOURCE

1. The contractor may assign quality assurance personnel at subcontractor or suppliers' facilities. Personnel shall conduct appropriate quality assurance activities, including inspections, to ensure that the subcontractor or supplier complies with applicable

requirements. Assignment of quality assurance personnel shall take place when one or more of the following conditions exist:

- a. In-process or end-item controls have such an effect on the quality of the articles that the quality cannot be determined solely by inspection or tests of the procured articles at the contractor's plant, or
 - b. Verification tests are destructive in nature and the quality cannot be verified solely by inspections or tests at the contractor's plant, or
 - c. The environments or test equipment required cannot be feasibly and economically reproduced or made available at the contractor's plant, or
 - d. Past performance or quality history of the subcontractor or supplier is marginal, or
 - e. Qualification testing is to be performed by the subcontractor or supplier, or
 - f. Articles or materials are designated for direct shipment from source to the procuring NASA Installation or using site.
2. The contractor will provide a list of duties, responsibilities and authorities of his assigned quality assurance personnel to the designated Government quality representative at the contractor's facility. When both Government source inspection personnel and contractor personnel are utilized at a supplier facility, the listing shall also be provided to the Government quality representative at the supplier's facility upon issuance of the procurement.

1B504 GOVERNMENT SOURCE INSPECTION

Source inspection performed by and for the convenience of the Government on procured articles or materials shall not, in any way, replace contractor source inspection or relieve the contractor of his responsibilities for ensuring their quality. The need for delegation of Government Source Inspection will be determined by the procuring NASA Installation or its designated Government quality representative.

1B505 RECEIVING INSPECTION SYSTEM

The contractor shall maintain a receiving inspection system which ensures:

1. That procured articles and materials indicate evidence of inspections and tests performed by the suppliers in accordance with purchase requirements and are accompanied with required inspection and test data.
2. That articles and materials or accompanying records exhibit evidence of contractor and Government Source Inspection, as required.

3. That supplier inspection and test data is acceptable by conducting inspections and tests of selected characteristics. As a minimum, receiving inspection and test shall include verification of characteristics and design criteria which have not been source inspected by the contractor and which can be verified without disassembly of the article. Particular emphasis shall be placed on those characteristics for which nonconformances may not be detected during subsequent inspection and test. Inspections and tests shall be accomplished in accordance with established inspection and test procedures.
4. That periodic disassembly is accomplished as appropriate for more detailed verification of the specified requirements.
5. That identification and data retrieval requirements have been met and are maintained; that all required data and records are complete and correct; and that articles and materials can be directly related to applicable supplier records.
6. That appropriate inspection and test equipment and technical documents are available at the proper places and at the proper times to perform the test and inspections.
7. That supplier records for articles and materials having definite characteristics of quality degradation or drift with age and/or use indicate the date and test time or cycle at which useful life was initiated and the life or cycles used. The records shall be maintained and updated if life or cycle use occurs during receiving inspection activities. The receiving inspection system shall also ensure that the articles and materials, when required, exhibit evidence of initiation of useful life, the life or cycles used, and the date and test time or cycle at which useful life will be expended.
8. When required by specification or drawing, chemical analyses and physical tests are performed on test specimens submitted with purchased articles and materials.
9. That chemical analyses and physical tests are conducted on samples randomly selected from materials received.
10. That the quality status of articles and materials is maintained during receiving inspection and test operations. This shall include physical separation and identification of articles and materials according to the following categories:
 - a. Items awaiting inspection or test results,
 - b. Conforming items, and
 - c. Nonconforming items.
11. That articles and materials and their records clearly indicate their acceptance or nonconformance status when released from receiving inspection and test.
12. That articles and materials to be released are adequately controlled and protected for subsequent handling, storage or use.

1B506 RECEIVING RECORDS

Receiving inspection and test records shall be maintained for articles and materials to indicate, as a minimum: date of receipt; accomplishment of applicable requirements of par. 1B505-1 through 12; results of inspections and tests; inspection and test procedures utilized; and disposition of the articles or materials. Records shall include copies of pertinent supplier documents received or an indication of the type of documents received and their location.

1B507 SUPPLIER RATING SYSTEM

Receiving inspection and test results shall be recorded to reflect on a continuous basis the qualitative and quantitative performance of individual suppliers and the quality histories of the supplied articles and materials. The contractor shall maintain a supplier rating system to aid in the selection of procurement sources based upon these results.

1B508 POST-AWARD SURVEY OF SUPPLIER OPERATIONS

1. The contractor shall schedule and conduct post-award surveys of suppliers based upon:
 - a. Criticality of items being procured.
 - b. Known problems or difficulties.
 - c. Supplier quality history.
 - d. Supplier fabrication and testing capability, and
 - e. Remaining period of supplier performance.
2. Each survey shall include examination of operations and documentation to determine compliance with established requirements as well as an examination of articles and materials to verify the effectiveness of the supplier's quality system.
3. A summary of survey results shall be documented, including problem areas discovered, with recommendations for timely correction and prevention of deficiencies; also recommendations for follow-up action.

1B509 COORDINATION OF CONTRACTOR-SUPPLIER INSPECTIONS AND TESTS

The contractor shall coordinate with selected suppliers to ensure compatibility of supplier inspections and tests with contractor inspections and tests of the procured article or material. The contractor shall provide technical assistance and training for suppliers as necessary.

1B510 NONCONFORMANCE INFORMATION FEEDBACK

The contractor shall rapidly feedback to suppliers information concerning supplier-responsible nonconformances which are detected during contractor inspection, fabrication or assembly operations, or during test or use. The contractor shall ensure that the supplier takes prompt remedial and preventive action to preclude recurrence of nonconformances.

CHAPTER 6: FABRICATION CONTROLS

1B600 FABRICATION OPERATIONS

The contractor shall control fabrication, including assembly, operations in order to ensure that characteristic and design criteria specified in technical documents are obtained and maintained in all contractor-fabricated articles. Detailed fabrication documents shall be generated and utilized by personnel conducting fabrication operations. Fabrication documents shall include or reference:

1. Nomenclature and identification of the article to be fabricated.
2. Tooling, jigs, fixtures, and other fabrication equipment to be utilized.
3. Characteristics and tolerances to be obtained.
4. Detailed procedures for controlling processes.
5. Special conditions to be maintained such as environmental conditions or precautions to be observed.
6. Workmanship standards.

1B601 ARTICLE AND MATERIAL CONTROLS

Controls shall ensure that only conforming articles and materials are released and used and those not required for the operation involved removed from work operations. Articles having definite characteristics of quality degradation or drift with age and/or use shall be marked to indicate the date, test time or cycle the critical life was initiated and the date, test time or cycle the useful life will be expended. Data shall be recorded and maintained for such articles in accordance with documented requirements. Articles and materials to be fabricated or processed in a temperature-controlled environment shall be inspected and tested in a similar environment to the extent necessary to prevent quality degradation.

1B602 CLEANLINESS CONTROL

Fabrication, assembly, inspection, and test areas shall be controlled in accordance with documented cleanliness requirements for environments, work surfaces, tools, fixtures, handling, storage and shipping containers, and test and inspection equipment to prevent contamination. Technical documents shall include requirements to be implemented and the method for maintaining and measuring conformance to these

requirements. Tests or inspections shall be performed to verify the cleanliness prior to initial use and at established intervals during use to ensure continued cleanliness.

1B603 PROCESS CONTROLS

1. The contractor shall implement controls for those processes where uniform, high quality cannot be assured by inspection of articles alone. These processes include, but are not limited to, metallurgical and chemical processes, metal joining processes, bonding processes, plastics application, plating and coating processes and surface treating processes. In addition, processes such as radiography, ultrasonics, liquid penetrant, and magnetic particle, shall be controlled to ensure that the results indicate the article or material quality levels.
2. PROCESS CONTROL PROCEDURES. Process procedures shall be prepared to implement applicable processing requirements and shall include detailed performance and control provisions. The procedures shall describe the preparation of the processing equipment and materials; the preparation of the articles or materials to be processed; detailed processing operations; conditions to be maintained during each phase of the process including environmental controls; the methods of verifying the adequacy of processing materials, solutions, equipment, environments, and their associated control parameters; and the required records for documenting the results of process inspection, test and verification.
3. EQUIPMENT CERTIFICATION. The contractor shall provide for the certification of equipment for selected processes. Records certifying that tests have been performed and the results of such tests shall be maintained. Equipment shall be recertified as indicated by the results of quality surveys, inspections or tests, or when changes are made which may affect process integrity.

1B604 WORKMANSHIP STANDARDS

Where samples or visual aids showing acceptable workmanship are necessary, they will be jointly selected by the contractor and the procuring NASA Installation or its designated Government quality representative. Standards shall be reviewed and revised or replaced as necessary to satisfy current requirements.

CHAPTER 7: INSPECTIONS AND TESTS

1B700 GENERAL

The contractor shall plan and conduct an inspection and test program which demonstrates that contract, drawing, and specification requirements are met. The program and its application to all phases of the contract shall provide maximum assurance that the quality inherent in the design is maintained.

1B701 INSPECTION AND TEST PLANNING

The contractor shall provide the necessary planning functions for the accomplishment of inspections and tests and an adequate documentation system which substantiates their accomplishment. The planning function shall provide for:

1. Orderly and timely inspection and testing at the earliest opportunity and through all phases;
2. Coordination and sequencing of inspection and testing conducted at successive levels of assembly to ensure satisfactory articles and materials and to minimize unnecessary testing;
3. Economical and effective use of equipment, facilities and personnel;
4. Availability of calibrated inspection and test equipment; and
5. Coordination of inspections and tests conducted by the designated Government quality representative.

1B702 TEST SPECIFICATIONS

The contractor shall prepare and utilize test specifications for each test to be performed. Specifications shall be available to test and inspection personnel. Each specification shall include as applicable: test item nomenclature and identification; test objectives; quantity to be tested; reliability goal; test parameters and tolerances; acceptance and rejection criteria; environmental conditions; hazardous operations or situations; reference to applicable safety standards, rules and regulations; allowable adjustment, repair, rework or maintenance operations; requirements for data recording, analysis, retest and reporting of test results; and disposition of test articles.

1B703 INSPECTION AND TEST PROCEDURES

For each inspection and test operation to be performed, the contractor shall prepare and utilize written procedures. These procedures shall be readily available to inspection and test personnel and shall be

physically located at the applicable station at the time of inspection or test. Each procedure shall include, as applicable:

1. Nomenclature and identification of the test article or material,
2. Characteristics and design criteria to be inspected or tested, including values for acceptance and rejection,
3. Identification of characteristics and design criteria established for inspection or test by the designated Government quality representative,
4. Detail steps and operations to be taken in sequence, including verifications to be made before proceeding,
5. Cross-reference of characteristics with measuring equipment to be used, specifying range and type,
6. Details or instructions for operation of special data recording equipment, or other automated test equipment.
7. Layout and interconnection of test equipment and articles,
8. Hazardous situations or operations,
9. Precautions to comply with established safety requirements, ensure safety of personnel, and to prevent damage or degradation of articles and measuring equipment,
10. Environments and other conditions to be maintained,
11. Workmanship standards,
12. Constraints on inspection or testing,
13. Special instructions for nonconformances, anomalous occurrences or results.

1B704 END-ITEM INSPECTION AND TEST SPECIFICATIONS AND PROCEDURES

Separate end-item inspection and test specifications and procedures shall be prepared and utilized for each end-item. These inspections and tests shall be conducted in a manner and under conditions which simulate end-use and environments to the highest degree practical without damage to the end-item, and which provide a valid measure of the overall quality of the end-item. The degree, duration, and number of tests performed on each end-item shall be sufficient to provide assurance that the end-item is capable of meeting contract requirements, and that the required quality and workmanship is present.

1B705 INSPECTION AND TEST PERFORMANCE

1. INSPECTIONS AND TESTS. Inspections and tests shall be established and performed to verify compliance with specifications and procedures. Inspections and tests shall be performed on procured

and fabricated articles prior to their installation into the next higher level of assembly. The inspections also will include records review. The contractor shall ensure that each inspection and test operation (and to the extent practicable, each fabrication and assembly operation) is traceable to the individual responsible for its accomplishment.

a. Control of Articles

- (1) Articles shall be inspected and tested in accordance with applicable technical documents.
- (2) Articles undergoing test shall not be adjusted, modified, repaired, reworked, or replaced except as specified in established documents, or in accordance with the requirements of Chapter 8.

b. Control of Inspection and Test Environments and Equipment

- (1) Environments shall be controlled to prevent compromising the quality of the article.
- (2) Equipment shall be controlled, maintained, and calibrated as specified in procedures for each equipment.

c. Criteria for Reinspection and Retest. Reinspection and retest may be required at any stage of contractor operations after accomplishment of remedial and preventive action whenever:

- (1) The article or material does not meet the contract or contractor specification requirements; or
- (2) The inspection or test performed is not in accordance with test specifications or inspection and test procedures, or
- (3) Equipment malfunctions occur, or
- (4) Modifications, repairs, replacements, or rework of the article or material occur after the start of inspection or testing, or
- (5) The article or material is subject to drift or degradation during storage or handling. Periodic intervals for reinspection or retest shall be established, or
- (6) Specified by Material Review Board (MRB). Retest shall be limited by consideration of remaining useful life and operating time for qualification.

2. QUALIFICATION TEST ARTICLES. Articles to be subjected to qualification testing shall be controlled according to the requirements of subpar. 1 and the following:

- a. Test articles shall be randomly selected, when possible, and shall have satisfactorily passed testing representative of that normally expected to occur prior to flight or other operational use.

- b. Test articles shall be identified so that they may be distinguished from identical articles for flight or operational use.
 - c. Test articles shall be representative of flight or operational articles which are fabricated and assembled in the same manner and to the same configuration.
 - d. The disposition of test articles shall be recorded. Such articles shall not be used for flight.
3. REQUALIFICATION TESTING. Requalification of previously qualified articles may be required when: changes have been made to the design of the articles, fabrication, or process operations; the source of procurement has changed; articles have repeated failures; or inspection, test, or operational data indicate the need for requalification. When one of the above conditions occurs, the contractor shall:
 - a. Provide the NASA Contracting Officer with information on the existing conditions and remedial and preventive action to be taken by the contractor, and
 - b. Specify the need for, and extent of requalification testing, and
 - c. Obtain NASA Contracting Officer approval prior to conducting requalification testing.
4. QUALIFICATION BASED ON SIMILARITY. Qualification tests performed on similar articles outside the scope of this contract may be accepted at the discretion of the procuring NASA Installation. Such articles may be qualified "Based on Similarity." For each article for which qualification based on similarity is requested by the contractor, similarity between the articles must be established and the article must have been tested to the environments, levels, times and operating conditions at least as stringent as qualification levels required for its intended application under the contract. Actual test data and results shall be submitted to the NASA Contracting Officer with each request for qualification based on similarity.
5. END-ITEM INSPECTIONS AND TESTS. The contractor shall perform inspections and tests of the completed end-item intended for delivery under the contract. Non-conformances discovered prior to start of end-item testing shall be closed out in accordance with the requirements of Chapter 8. Nonconformances discovered during and after testing shall be closed-out prior to succeeding operations, including shipping, in accordance with Chapter 8. The inspections and tests shall be performed in accordance with the end-item test specifications and procedures. In addition to determining contractual conformance, the contractor shall report immediately to the procuring NASA Installation and its designated Government quality representative any unusual phenomena, occurrence, difficulty, or questionable condition, whose detection and correction is not specifically contained in the applicable requirements in order that

necessary actions can be initiated. The contractor shall stop testing when safety of personnel is in jeopardy or damage to the end-item or associated test equipment is possible.

6. END-ITEM REINSPECTION AND RETEST. Adjustments, modifications, repairs, replacements, or rework after completion of end-item inspections and tests shall require prior approval of the designated Government quality representative, if so authorized. The contractor shall evaluate the conditions involved and recommend to the representative the extent of reinspection and/or retest necessary.
7. END-ITEM INSPECTION AND TEST REPORT. The contractor shall prepare a summary type test report of each end-item required by the contract. The report shall include, but not be limited to, the following:
 - a. End-item nomenclature and identification.
 - b. Identification of articles removed and those replaced during end-item test.
 - c. Copies of approved requests for nonconformances requiring NASA Contracting Officer approval (see par. 1B805).
 - d. List of authorized tests or retests not completed in accordance with approved procedures.
 - e. Summary of test data and results.
 - f. Listing of critical and limited life articles.
 - g. Total operating time/cycle records for each system and subsystem.

1B706 INSPECTION AND TEST RECORDS AND DATA

1. The contractor shall generate and maintain records and data of all inspections and tests performed. The records and data generated shall be appropriate for the particular type, scope, and importance of the inspection or test operation performed and sufficient in detail and extent to provide for complete verification and evaluation of the operations and objectives. Records shall disclose the status of articles and materials and evidence of inspections and tests performed, including the dates.
2. EQUIPMENT RECORDS. The contractor shall prepare, maintain and update the equipment record for each subsystem and system as a means of documenting its continuous history. Each record shall be identifiable to the pertinent equipment and shall be maintained in chronological order to account for all fabrication, assembly, inspection and test operations, as well as idle periods (storage) and movements of equipment. Entries shall be complete, self-explanatory and signed, and should include or refer to details such as the following:
 - a. Configuration data: parts list, drawings, specifications, changes, and identification data.

- b. Fabrication and assembly history: build-up and disassembly instructions, repairs, rework, modifications.
- c. Inspection and test records: specifications, procedures, results, variables data.
- d. Nonconformance summary: initial review and MRB actions, remedial and preventive actions, Contracting Officer approvals.
- e. Cumulative operating times or cycles.
- f. Maintenance records.

The contract shall specify the equipment for which records shall be prepared, the level of assembly or operation at which they shall be initiated and requirements for submittal or shipment to equipment destination. Subsystem records shall be combined into system records. When a subsystem is operated or handled independently, including removal from its system, its record shall be maintained current.

1B707 CONTRACTOR QUALITY ASSURANCE ACTIONS

1. Prior to testing, the contractor's quality assurance personnel shall:
 - a. Verify that applicable inspection and test documents are available.
 - b. Ensure that requirements for selection and control of articles have been implemented and that test constraints have been resolved.
 - c. Verify that articles are identified.
 - d. Verify configuration of articles.
 - e. Verify that configuration of GSE is consistent with articles under test.
 - f. Verify that test equipment is calibrated and such calibration will be effective and sustained during the test period.
2. During testing, the contractor's quality assurance personnel shall:
 - a. Ensure that testing is accomplished in accordance with test specifications and procedures.
 - b. Ensure accurate and complete recording of data and test results.
 - c. Document rework, repair or modification occurring during the test operation.

- d. Document nonconformances and participate in their dispositions.
3. Subsequent to testing, the contractor's quality assurance personnel shall:
- a. Ensure proper disposition of articles.
 - b. Report any additional nonconformances and participate in their dispositions.
 - c. Ensure that remedial and preventive action has been accomplished relative to nonconformances.
 - d. Verify that test results and reports are accurate, complete, and traceable to the tested articles.

CHAPTER 8: NONCONFORMING ARTICLE AND MATERIAL CONTROL

1B800 NONCONFORMING ARTICLE AND MATERIAL CONTROL

When an article or material does not conform to applicable drawings, specifications or other requirements, it shall be identified as nonconforming, segregated to the extent practicable and held for review action.

1B801 NONCONFORMANCE DOCUMENTATION

The contractor shall:

1. Ensure documentation of nonconformances discovered by contractor, subcontractor, and supplier personnel and the designated Government quality representative.
2. Prepare and issue documents for each nonconformance comprising as a minimum:
 - a. A unique and traceable number.
 - b. The nomenclature and identification of the nonconforming article or material.
 - c. A description of the nonconformance and the required characteristic or design criteria.
 - d. Cause or reason for the nonconformance.
 - e. Remedial actions taken or recommended.
 - f. Disposition of the nonconforming article or material.
 - g. Initiator of the document.
 - h. Signatures of authorized personnel.

1B802 REMEDIAL AND PREVENTIVE ACTION

The contractor shall:

1. Conduct appropriate analysis and examination of nonconforming articles, materials or conditions to determine the cause or reason for the nonconformance. Nonconforming articles or materials shall be forwarded to the procuring NASA Installation as requested by the NASA Contracting Officer.

2. Conduct timely and effective remedial action to ensure the correction of the article or material.
3. Conduct timely and effective preventive action to prevent recurrence of the nonconformance including correction of technical documents, correction of other identical articles or materials at all locations and the prevention of detrimental side effects.
4. Assign responsibility for follow-up of remedial and preventive actions to ensure accomplishment.
5. Notify responsible contractor or supplier organizational elements of nonconformances and the need for remedial and preventive actions.
6. Classify nonconformances as to criticality and process on a priority basis.
7. Closeout nonconformance documentation after verifying that effective remedial and preventive actions have been taken.
8. Appropriately document analyses and remedial and preventive actions.
9. Notify the procuring NASA Installation of nonconformances and their related remedial and preventive actions, as established by contract.

1B803 INITIAL REVIEW DISPOSITIONS

1. Nonconforming articles or materials shall be reviewed initially by contractor quality assurance personnel and shall be subjected to one of the following dispositions:
 - a. Return for Rework or Completion of Operations. If the nonconformance is in the category of "return for completion of operations" or "return for rework to drawings, specifications or procedures," the article or material shall be returned for rework or completion using established technical documents and operations. During such rework, the article or material shall be resubmitted to normal inspection and/or test operations.
 - b. Scrap. If the article or material is obviously unfit for use, it shall be dispositioned in accordance with Government-approved contractor procedures for identifying, controlling, and disposing of scrap.
 - c. Return to supplier. When an article or material is found to be nonconforming on receipt, it may be returned to the supplier. The contractor shall provide the supplier with nonconformance information, and assistance as necessary, to permit remedial and preventive action.

- d. Submit to Material Review Board. When the dispositions as described above are not appropriate, the article or material shall be submitted to the Material Review Board (MRB) for final disposition.
2. Articles and materials disposed of without referral to MRB may be subject to a review of each case by the designated Government quality representative to verify contractor decisions.
3. Initial review dispositions shall be recorded on nonconformance documentation.

1B804 MATERIAL REVIEW BOARD

1. MEMBERSHIP. The Material Review Board shall be comprised of one contractor representative whose primary responsibility is engineering, one contractor representative whose primary responsibility is quality, and the designated Government quality representative. Contractor members for the Material Review Board shall be selected by the contractor on the basis of technical competence and shall have sufficient authority to make appropriate dispositions of the article or material involved. Contractor personnel designated for membership shall be approved by the Government representative.
2. RESPONSIBILITY. The Material Review Board shall:
 - a. Determine disposition of submitted articles or materials designated as nonconforming.
 - b. Ensure that effective remedial and preventive actions are documented on the nonconformance document prior to disposition.
 - c. Provide contractor recommendations to the Contracting Officer concerning nonconformance dispositions requiring his approval and verify implementation after approval is obtained.
 - d. Ensure that accurate records of MRB actions are maintained.
3. MRB DISPOSITIONS. Dispositions, other than scrap, require the unanimous agreement of the Board members. In determining dispositions, the Board shall: consider the effect of the nonconformance upon the intended use, review records of earlier review actions affecting the same article or material, and consider the recommendations of personnel acting in an advisory capacity. After MRB has determined that an initial review disposition to submit a nonconforming article or material to MRB is appropriate, the Board shall specify on the nonconformance document one of the following dispositions:
 - a. Repair. When, in the opinion of the Board, an acceptable repair is possible, repair action may be authorized. Procedures shall be established or approved by the MRB to perform this repair. Procedures shall include appropriate inspections and tests to verify the acceptability of the repair.

- b. Scrap. If the article or material is unfit for use, it shall be dispositioned in accordance with Government approved contractor procedures for identifying, controlling, and disposing of scrap.
- c. Use As Is. Nonconformances which do not adversely affect safety, reliability, durability, performance, interchangeability, weight, or the basic objectives of the contract may be accepted for use as is. The rationale for making a use as is disposition shall be documented on the nonconformance report.
- d. Request NASA Contracting Officer Approval. Nonconformances which do adversely affect safety, reliability, durability, performance, interchangeability, weight, or the basic objectives of the contract shall be referred to the NASA Contracting Officer. (See par. 1B805.)

1B805 WRITTEN REQUESTS FOR NASA CONTRACTING OFFICER APPROVAL

Contractor written requests for nonconformances for which the contractor recommends a disposition to repair or use as is must be submitted to the NASA Contracting Officer when the nonconformance adversely affects safety, reliability, durability, performance, interchangeability, weight, or the basic objectives of the contract. Such requests require NASA Contracting Officer approval. Each nonconformance request shall be submitted through the MRB with written recommendations and proposed remedial and preventive action. Articles and materials shall be withheld from further processing until Contracting Officer approval is obtained.

1B806 SUPPLIER MATERIAL REVIEW BOARD

The contractor may, with approval of the procuring NASA Installation or its designated Government quality representative, delegate MRB responsibility to suppliers.

CHAPTER 9: METROLOGY CONTROLS

1B900 GENERAL

The contractor shall establish and utilize a documented metrology system to control measurement processes in order to provide objective evidence of quality conformance. Measurement standards and equipment shall be selected and controlled to the degree necessary to meet the requirements of this Chapter. Measurement processes shall be performed in accordance with established written procedures.

1B901 ACCEPTANCE

Prior to acceptance, the contractor shall ensure that all measurement standards and equipment are inspected and/or tested to ensure conformance with requirements. Documented results of the inspection and/or tests shall be maintained by the contractor.

1B902 EVALUATION

All special measurement standards and equipment (e.g., automatic test and checkout equipment) shall be evaluated under intended operating conditions to verify that:

1. When used in the intended measurement process, the standards and equipment measure the desired characteristics to the required accuracy and provide the desired indications or records.
2. Standards and equipment are compatible with the configuration of related hardware and environmental conditions.
3. Operating instructions are correct and complete. Documented results of the evaluations shall be maintained by the contractor.

1B903 ARTICLE OR MATERIAL MEASUREMENT PROCESSES

Random and systematic errors in any article or material measurement process shall not exceed 10% of the tolerance of the article or material characteristic being measured. Authorization for exception shall be requested from the procuring NASA Installation.

1B904 CALIBRATION MEASUREMENT PROCESSES

Random and systematic errors in any calibration measurement process shall not exceed 25% of the tolerance of the parameter being measured. Authorization for exception shall be requested from the procuring NASA Installation.

1B905 CALIBRATION CONTROLS

1. The contractor shall have his own or use the services of an outside facility for the calibration of measurement standards and equipment.
2. TRACEABILITY. All measurement standards shall be traceable to standards maintained by the National Bureau of Standards or their value(s) shall be derived from a controlled measurement process utilizing a fundamental constant of nature.
3. HANDLING, STORAGE, AND TRANSPORTATION. All measurement standards and equipment shall be handled, stored and transported in a manner which shall not adversely affect quality nor result in hazardous conditions.
4. IDENTIFICATION AND LABELLING. All measurement standards and equipment shall be uniquely identified and labelled, tagged or coded to indicate calibration status and due date of next calibration.
5. CALIBRATION INTERVALS. Calibration intervals shall be established and periodically reviewed to maximize the availability of measurement standards and equipment without adversely affecting quality. Intervals shall depend upon the use, accuracy, type of standard or equipment, required precision and other conditions adversely affecting the measurement process.
6. RECALL SYSTEM. All standards and equipment used in measurement processes shall be recalled and recalibrated at established intervals. Standards and equipment not recalibrated before the recall due date shall be removed from service or otherwise restricted from use. Authorization for exception shall be obtained from the procuring NASA Installation. Controls shall be established to ensure the immediate recalibration or removal from service of those found to exceed the established interval or which for any reason might have an adverse affect on quality.
7. CALIBRATION RECORDS. The contractor shall maintain individual records of measurement standards and equipment. These records shall include but not be limited to the following:
 - a. Identification of standard or equipment to be calibrated.
 - b. Identification of standard, equipment, and calibration procedure utilized in the calibration process.
 - c. Calibration intervals.
 - d. Dates and results of each calibration.
 - e. Due date of next calibration.

- f. Individual(s) performing calibration.
- g. Calibration facility.
- h. Degree of nonconformance of standards or equipment received for calibration.

1B906 ENVIRONMENTAL REQUIREMENTS

Environmental characteristics (e.g., temperature, humidity, vibration, cleanliness) shall be compatible with the accuracy requirements of the article and material and calibration measurement processes.

1B907 REMEDIAL AND PREVENTIVE ACTION

Remedial and preventive action shall be taken relative to nonconforming measurement standards or equipment and to the article and material measured by the nonconforming standard or equipment.

CHAPTER 10: STAMP CONTROLS

1B1000 STAMP CONTROL SYSTEM

The contractor shall establish and maintain a documented stamp control system, including written procedures, which provide for the following:

1. Stamps, decals, seals, torque wax, paints, signatures, etc., shall identify that articles and materials have undergone source and receiving inspection, in-process fabrication and inspection, end-item fabrication and inspection, end-item testing, storage, and shipment.
2. Stamps shall be traceable to each individual responsible for their use and records shall be maintained to identify individuals with specific stamps. Fabrication and inspection stamps shall be of different design.
3. Stamps shall be applied to records to indicate the fabrication or inspection status of associated articles and materials.
4. Stamps shall be applied to tags, cards, or labels attached to individual articles and materials or their containers, as appropriate.
5. Stamps indicating that fabrication, inspection or test operations have been performed may be applied directly to articles and materials except when this is impractical due to physical limitations of the article or such applications will compromise their quality.
6. Stamping methods and marking materials must be compatible with the articles and their use.

1B1001 STAMP RESTRICTION

Contractor's stamps shall not contain the designation "NASA."

CHAPTER 11: HANDLING, STORAGE, PRESERVATION, MARKING, LABELLING, PACKAGING, PACKING AND SHIPPING

1B1100 HANDLING AND STORAGE

1. HANDLING. The contractor shall protect articles and materials during all phases of fabrication, processing, and storage to prevent handling damage. Special handling instructions shall be forwarded to the receiving activities. Evidence of initial and periodic proof testing of handling equipment shall be maintained.
2. STORAGE. Articles and materials to be stored shall be protected against deterioration and damage. Articles and materials subject to age deterioration shall include on the container an indication of the date that the critical life of the article or material was initiated and the date at which the useful life will be expended. Procedures shall be generated and utilized to ensure the safety of personnel and the maintenance, positive identification, periodic inspection and periodic test of articles.

1B1101 PRESERVATION, MARKING AND LABELLING, PACKAGING AND PACKING

1. PRESERVATION. Articles and materials subject to deterioration, contamination or corrosion through exposure to air, moisture, or other elements during fabrication and storage shall be cleaned and preserved by methods which ensure maximum life and utility.
2. MARKING AND LABELLING. The contractor shall ensure that appropriate marking and labelling for packaging, shipment and storage of articles and materials are performed in accordance with applicable specification and/or contractual requirements. Critical, sensitive, dangerous and high-value articles shall be given special attention.
3. PACKAGING. Articles and materials shall be packaged to prevent deterioration, corrosion, damage, and contamination. Packaging procedures and instructions shall be utilized and provide for protection to articles and materials while at the contractor's plant, during transportation to destination, and upon arrival at destination. When maintenance of specific internal or external environments are necessary, these shall be included in the packaging and necessary environmental requirements shall be detailed on the exterior of the package or reference environmental procedures. When existing packaging specifications are not adequate to fully protect critical, sensitive, dangerous, or high-value articles, special packaging shall be designed, documented and utilized.

4. PACKING. The contractor shall provide for cushioning, blocking, bracing, or bolting, as applicable, to prevent rupture of flexible barriers, undesired free movement within containers, and physical damage due to transmission of shock and vibration. Tests shall be performed when necessary to ensure proper packing protection.

1B1102 SHIPPING

1. CONTROL. The contractor shall control all articles and materials shipped from his plant to ensure that:
 - a. All fabrication, assembly, inspection and testing operations authorized and required to be performed at the plant or test site have been satisfactorily completed.
 - b. Accompanying documents have been properly identified as to inspection status by appropriate contractor's stamps.
 - c. They have been preserved and packaged in accordance with applicable procedures and requirements.
 - d. All articles and materials have been identified and marked in accordance with applicable procedures and specifications.
 - e. In the absence of packing and marking requirements in the contract or subcontract, packing and marking of articles and materials shall comply with Interstate Commerce Commission rules and regulations and shall ensure safe arrival and ready identification at destination.
 - f. Handling devices and transportation vehicles are suitable for the articles and materials involved so as to prevent damage.
 - g. The loading and transportation methods conform to applicable specifications and requirements.

In the event of any unscheduled removal of an article or material from its container, the extent of reinspection and retest shall be as authorized by the procuring NASA Installation or its designated Government quality representative.

2. DOCUMENTATION PACKAGE. The contractor shall include a complete documentation package with his shipment. This package shall contain documentation required to identify, maintain, preserve, and utilize the shipment and shall consist of those documents specified by the contract to be submitted with the shipment. Each shipping container shall identify the location of the documentation package.

CHAPTER 12: SAMPLING PLANS, STATISTICAL PLANNING AND ANALYSIS

1B1200 SAMPLING PLANS

Sampling plans may be used when inspection or tests are destructive, or data, inherent characteristics, or the noncritical application of an article or material indicate that a reduction in inspection or testing can be achieved without jeopardizing achievement of quality, reliability, or design intent. When sampling techniques are to be employed, existing military sampling inspection documents will be utilized to the degree practicable. Sampling plans other than those contained in existing military documents may be utilized by the contractor. All sampling plans require the approval of the procuring NASA Installation or its designated Government quality representative.

1B1201 STATISTICAL PLANNING AND ANALYSIS

Statistical planning and analysis may be used where such use will provide effective control over fabrication and inspection operations, especially in those areas where special processes and equipment are difficult to control. Charts shall be maintained at a location which will provide maximum use as a preventive action tool.

CHAPTER 13: GOVERNMENT PROPERTY CONTROL

1B1300 CONTRACTOR'S RESPONSIBILITY

The contractor shall be responsible and account for all Government property supplied by the Government in accordance with the provisions of the contract, including property provided under such contract which may be in the possession or control of a supplier. The contractor's responsibility shall include, but not be limited to, the following:

1. Upon receipt, examine to detect damage in transit.
2. Inspect for quantity, completeness, proper type, size, and grade as specified in the shipping documents.
3. Provide for the protection, maintenance, calibration, periodic inspection, segregation, and controls necessary to preclude damage or deterioration during handling, storage, installation, or shipment.
4. Maintain records which include:
 - a. Identification of the property.
 - b. Dates, types and results of contractor inspections, tests, and other significant events.
5. Functional test to determine satisfactory operation prior to processing or installation.

1B1301 UNSUITABLE GOVERNMENT PROPERTY

The contractor shall identify, segregate, and report in accordance with Government procedures, any Government property found damaged, malfunctioning, or otherwise unsuitable for use as soon as the fact is known. Government property shall not be dispositioned, repaired, reworked, replaced, or in any way modified unless authorized by the contract.

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APPENDIX B: GLOSSARY OF TERMS

Acceptance: The act of an authorized representative of the Government by which the Government assents to ownership of existing and identified contract items, or approves specific services rendered as partial or complete performance of the contract.

Analysis (Nonconformance): The study of a specific nonconformance, such as a failure, in order to determine the causes and to arrive at a course of remedial and preventive action.

Article: A unit of hardware or any portion thereof required by the contract.

Certification (Personnel): The act of verifying and documenting that personnel have completed required training and have demonstrated specified proficiency.

Certification (Process): A written statement based on objective quality evidence that a process conforms to specified requirements.

Characteristic: Any dimensional, visual, functional, mechanical, electrical, chemical, physical or material feature or property; and any control element which describes and establishes the design, fabrication and operating requirements of an article or material.

Configuration: The complete technical description required to fabricate, test, accept, operate, maintain, and logistically support an article.

Conforming: An article, material, or service, which complies with specified requirements.

Contract: The prime contract executed by the Government and the prime contractor which, in addition to the terms and conditions thereof, includes by reference or otherwise, specifications, drawings, exhibits, and other data necessary to its proper performance.

Contract Schedule: That portion of a Government prime contract which describes the articles or services desired for that particular contract. Not to be confused with contract time-schedule or delivery schedule.

Contracting Officer: Any Government employee who is currently designated a Contracting Officer with the authority to enter into and administer contracts and make determinations and findings with respect thereto, or with any part of such authority. The term also includes the authorized representative of the Contracting Officer acting within the limits of his authority.

Contractor: The individual(s) or concern(s) who enter into a prime contract with the Government.

Contractor-Acquired Property: Property procured or otherwise provided by the contractor for the performance of a contract, title to which is vested in the Government.

Date Code: A symbol which indicates a specific date in code. A date code may consist of a series of numbers or letters that indicate day, week, month, or year.

Degradation: The deterioration of quality or ability to perform within established limits.

Delivery: The physical transfer of possession. The contract specifies the point and/time at which delivery takes place.

Designated Government Quality Representative: An individual designated by the procuring NASA Installation to perform a specific function(s) relative to the contractor's quality assurance effort.

Effectivity: The point at which an action occurs to produce a desired result.

End Item: An aeronautical or space system or any of its principal system or subsystem elements, e.g., launch vehicle, spacecraft, ground support system, propulsion engine, or guidance system. Also, articles covered by major sub-contracts where this publication is invoked. Also, articles which will be delivered direct to a Government Installation or provided as GFP to a contractor.

Fabrication: The act of manufacturing or making; also, the building, assembly, or construction of articles and materials.

Functional Test: A test performed to demonstrate that the article operates as required.

Government Property: All property owned by or leased to the Government or acquired by the Government under the terms of a contract. Government property includes both Government-furnished property and contractor-acquired property.

Government-Furnished Property: Property in the possession of, or acquired directly by the Government and subsequently delivered or otherwise made available to the contractor.

In-Process Inspection: Inspection which is performed during the fabrication cycle.

Inspection: The process of measuring, examining, gaging, or otherwise comparing an article or service with specified requirements.

Limited Life Articles: Articles whose usefulness is limited to a specified time or cycle.

Material: The substances of which an article is composed.

Measuring Equipment: Gages, inspection, measuring and test equipment, automated equipment, tools, jigs, fixtures, etc. which measure characteristics and parameters. Includes production tools incorporating an inspection, measuring or test function used for acceptance.

Measurement Processes: The application of standards, equipment, methods, environment and personnel to determine the magnitude of characteristics and parameters of articles, equipment and standards.

Nonconformance: A condition of any article, material, or service in which one or more characteristics do not conform to requirements. Includes failures, discrepancies, deficiencies, defects and malfunctions.

Preventive Action: Action to preclude or minimize the occurrence or recurrence of a nonconformance.

Qualification: Determination that an article or material is capable of meeting all prescribed design requirements.

Quality Assurance: A planned and systematic pattern of all actions necessary to provide adequate confidence that the end-item will meet all specified requirements.

Remedial Action: Action to correct a nonconforming article or material.

Repair: Operations performed on a nonconforming article to place it in usable and acceptable condition.

Rework: The continuation of processing of articles and materials that will make them conform to drawings, specifications, procedures, or contract.

Source Inspection (Government or Contractor): Inspection at the plant of the actual supplier of articles, materials, or services.

Subcontract: A contract or purchase order entered into under a Government prime contract by a supplier. May include orders issued to activities or subdivisions of the contractor.

Subcontractor: The individual(s) or concern(s) who enter into a purchase agreement under a Government prime contract.

Supplier: A subcontractor, at any tier, performing the services or producing the contract articles for the contractor.